

What is claimed is:

1. An automatic injection device containing a pre-loaded charge of medicament for automatically self-administering the medicament upon actuation thereof, the device comprising:

a housing;

a medicament chamber disposed in the housing, the medicament chamber including a first compartment containing a dry medicament portion, and a second compartment containing a wet medicament portion to be mixed with the dry medicament portion;

a seal structure between the first compartment and the second compartment, the seal structure being initially in a sealing condition that maintains the first compartment separate from the second compartment, the seal structure including:

at least one flow path formed therein, and

an annular wiper portion disposed at the front end of the seal structure and positioned to movably engage inner walls of the first compartment as the seal structure is moved through said first compartment, said wiper portion being configured to direct dry medicament particles engaged with the inner walls radially inwardly as the seal structure moves through the first compartment, the seal structure being converted to a mixing condition as a result of activation of the device;

a needle assembly that dispenses the mixed medicament portions from the medicament chamber; and

an activation assembly carried by the housing and including a stored energy source, wherein activation of the activation assembly releases the stored energy from the stored energy source, causing the seal structure to be converted from the sealing condition to the mixing condition, and thereby causing or allowing the medicament portions to be mixed and forced through the needle assembly.

2. The automatic injection device of claim 1, wherein the first compartment is adjacent the needle assembly and disposed forwardly of the second compartment.

3. The automatic injection device of claim 1, further comprising an insert mounted in the forward end of the chamber adjacent the needle assembly, the insert defining a tapering flow pathway that tapers radially inwardly as it extends axially forwardly.

4. The automatic injection device of claim 3, further comprising a filter positioned between the medicament chamber and the needle assembly.

5. The automatic injection device of claim 4, wherein the needle assembly comprises a needle support for mounting the needle assembly to a front end of the medicament chamber, the needle support defining a chamber provided adjacent to the filter on a needle assembly side of the filter.

6. The automatic injection device of claim 5, wherein the needle support chamber adjacent to the filter has an enlarged rearward end opening of a size that is at least as large as a front end opening of the insert.

7. The automatic injection device of claim 6, wherein the needle support chamber adjacent to the filter has a substantially hemispherical shape.

8. The automatic injection device of claim 7, further comprising a fluid distributing member disposed between the first compartment and the second compartment.

9. The automatic injection device of claim 8, wherein the fluid distributing member is a filter.

10. The automatic injection device of claim 1, wherein the seal structure comprises an outer seal structure carrying the wiper portion, the flow path being formed in the outer seal structure, and a plug member for sealing the flow path when the seal structure is in the sealing condition.

11. The automatic injection device of claim 10, wherein the seal structure has an outer periphery that forms a peripheral seal with an interior wall of the medicament chamber, and wherein said plug member is spaced radially inward from the peripheral seal that seals the at least one flow path formed in the seal structure.

12. The automatic injection device of claim 1, wherein the wiper portion comprises a peripheral lip having an inner surface that extends radially inwardly as it extends axially rearwardly.

13. An automatic injection device containing a pre-loaded charge of medicament for automatically self-administering the medicament upon actuation thereof, the device comprising:

- a housing;

- a medicament chamber disposed in the housing, the medicament chamber including a first compartment containing a first medicament portion, and a second compartment containing a second medicament portion to be mixed with the first medicament portion;

- a seal structure between the first compartment and the second compartment, the seal structure being initially in a sealing condition that maintains the first compartment separate from the second compartment, the seal structure being converted to a mixing condition as a result of activation of the device;

- a needle assembly that dispenses the medicament charge from the medicament chamber, the needle assembly having a rearward opening with a diameter that is less than a diameter of the medicament chamber;

- an insert mounted in a forward end of the medicament chamber adjacent the needle assembly, the insert defining a tapering flow pathway that tapers radially inwardly as it extends axially forwardly;

- an activation assembly carried by the housing and including a stored energy source, wherein activation of the activation assembly releases the stored energy from the stored energy source, causing the seal structure to be converted from the sealing condition to the

mixing condition, and thereby causing or allowing the first and second medicament portions to be mixed, directed by the insert radially inwardly toward the rearward opening in the needle assembly, and forced through the needle assembly.

14. The automatic injection device of claim 13, further comprising a filter positioned between the medicament chamber and the needle assembly.

15. The automatic injection device of claim 14, wherein the needle assembly comprises a needle support for mounting the needle assembly to a front end of the medicament chamber, the needle support defining a chamber provided adjacent to the filter on a needle assembly side of the filter.

16. The automatic injection device of claim 15, wherein the rearward opening of the needle assembly comprises a rearward end opening in the needle support chamber adjacent to the filter, the rearward end opening having a size that is at least as large as a front end opening of the insert.

17. The automatic injection device of claim 16, further comprising a fluid distributing member carried by the seal structure.

18. The automatic injection device of claim 13, wherein the seal structure comprises an outer seal structure carrying a wiper portion, a flow path formed in the outer seal structure, and a plug member for sealing the flow path when the seal structure is in the sealing condition.

19. The automatic injection device of claim 18, wherein the seal structure has an outer periphery that forms a peripheral seal with an interior wall of the interior chamber, and wherein said plug member is spaced radially inward from the peripheral seal that seals the at least one flow path formed in the seal structure.

20. The automatic injection device of claim 19, wherein the wiper portion comprises a peripheral lip having an inner surface that extends radially inwardly as it extends axially rearwardly.

21. An automatic injection device containing a pre-loaded charge of medicament for automatically self-administering the medicament upon actuation thereof, the device comprising:

a housing;

a medicament chamber disposed in the housing, the medicament chamber including a first compartment containing a first medicament portion, and a second compartment containing a second medicament portion to be mixed with the first medicament portion;

a seal structure between the first compartment and the second compartment, the seal structure being initially in a sealing condition that maintains the first compartment separate from the second compartment, the seal structure being converted to a mixing condition as a result of activation of the device;

a needle assembly that dispenses the medicament charge from the medicament chamber;

a filter positioned between the medicament chamber and the needle assembly; and

an activation assembly carried by the housing and including a stored energy source, wherein activation of the activation assembly releases the stored energy from the stored energy source, causing the seal structure to be converted from the sealing condition to the mixing condition, and thereby causing or allowing the first and second medicament compounds to be mixed and forced through the needle assembly;

wherein the needle assembly comprises a needle and a needle support for mounting the needle to the medicament chamber, the needle support defining a needle assembly chamber having a rearward opening covered by the filter, the needle assembly chamber having an inner surface tapering radially inwardly as it extends axially forwardly toward a rearward end of the needle.

22. The automatic injection device of claim 21, wherein no rearward portion of the needle protrudes into the needle assembly chamber.

23. The automatic injection device of claim 22, wherein the needle assembly chamber has a substantially hemispherical shape.

24. The automatic injection device of claim 23, further comprising an insert mounted in the forward end of the chamber adjacent the needle assembly, the insert defining a tapering flow pathway that tapers radially inwardly as it extends axially forwardly.

25. The automatic injection device of claim 24, further comprising a fluid distributing member carried by the seal structure.

26. The automatic injection device of claim 21, wherein the seal structure comprises an outer seal structure carrying a wiper portion, a flow path formed in the outer seal structure, and a plug member for sealing the flow path when the seal structure is in the sealing condition..

27. The automatic injection device of claim 26, wherein the seal structure has an outer periphery that forms a peripheral seal with an interior wall of the medicament chamber, and wherein said plug member is spaced radially inward from the peripheral seal that seals the at least one flow path formed in the seal structure.

28. The automatic injection device of claim 27, wherein the first medicament portion comprises a dry medicament portion and the wiper portion carried by the outer seal structure is configured to direct dry medicament particles engaged with the walls of the medicament chamber radially inwardly as the seal structure is moved through the first compartment.

29. A method of providing a medicament containing chamber of an automatic injection device, comprising:

inserting a seal structure into the chamber to divide the chamber into a front compartment and a rear compartment;

filling the rear compartment of the chamber with a wet medicament portion through a rear end of the chamber;

sealing the rear end of the rear compartment of the chamber;

filling the front compartment of the chamber with a dry medicament portion through a front end of the chamber; and

sealing the front end of the front compartment of the chamber.

30. The method of claim 29, wherein sealing the front end of the front compartment comprises placing a tapered insert in the front end of the chamber, the tapered insert having a tapered flow pathway therein, the flow pathway being tapered so that the diameter thereof increases as it extends rearwardly.

31. The method of claim 30, further comprising attaching a needle assembly to the front end.

32. The method of claim 29, wherein the rear compartment of the chamber is filled with the wet medicament portion before the front compartment of the chamber is filled with the dry medicament portion.

33. The method of claim 32, wherein the seal structure is inserted before the rear compartment is filled with the wet medicament portion.

34. The method of claim 29, wherein the dry medicament portion is a powder.

35. The method of claim 29, wherein the dry medicament portion is a tablet sized and adapted to fit through the front end of the chamber.

36. The method of claim 35, wherein the tablet is prepared by lyophilizing a liquid suspension or solution containing suspended or dissolved dry medicament portion in a separate container.